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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN OR RELATING TO FRICTION WINDING GEAR

(71) We, BRITISH ROPES LIMITED, a British Company, of Warmsworth Hall, Doncaster, Yorkshire, do hereby declare this invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to haulage systems, and more particularly to flexible hauling or load bearing members for such systems. The invention can be applied to various types of haulage system in which a flexible member is required to support or haul a load, for example in friction winding systems, drum winding systems, elevators, conveyors and various mining haulage applications.

In conventional systems, the hauling or load bearing member is usually a multi-filamentary strand comprising a plurality of contacting wires, either parallel laid or helically wound. To increase the load capacity of the system, several strands can be combined to form a rope, or several spaced strands or ropes are sometimes used.

An alternative system is disclosed in our British Patent No. 1,128,220 in which a load bearing member is used in a friction winding gear the member comprising a plurality of laterally spaced lengths of mono-filamentary material. Such an arrangement has considerable advantages over other systems employing multi-filamentary strands. For example the fatigue life of individual filaments is considerably longer than that of strands since the filaments within each strand tend to chafe against each other to precipitate earlier failure. Furthermore the mechanical characteristics of filaments can be more accurately forecast, so that the system safety factor can be reduced with a resultant increase in usable pay load.

An object of the present invention is to provide an improved load bearing member in which the detrimental effects of friction, abrasion and other forms of mechanical damage on the filaments of the load bearing member may be minimised .

The present invention provides a load bearing member for a haulage system, comprising a layer of spaced parallel load bearing mono-filaments covered at least on its opposed faces by protective resiliently deformable plastics material, the mono-filaments not adhering to the plastics material.

Preferably the layer of filaments is disposed between two protective strips of resiliently deformable plastics material; the filaments are preferably completely sealed from the environment by covering the otherwise open side edges of the load-bearing member with resiliently deformable plastics material, which can be integral with one or both of the said strips.

If required a member of greater strength can be provided by utilizing several superimposed layers of filaments in parallel planes, adjacent layers being separated by resiliently deformable plastics material. In this arrangement the outer layers of filaments should be covered by resiliently deformable plastics material.

When the filaments of the load bearing member according to the invention are under load, they are resiliently embedded in the plastics material, which improves the retention in position of the filaments and protects them from damage by friction, abrasion, etc.

The invention will now be further described, by way of example, with reference to the drawings accompanying the Provisional Specification, in which:—

Figure 1 is a sectional isometric view of part of a load bearing member for a haulage system;

Figure 2 is a fragmentary cross-section of the member of Figure 1 when under tension;

Figure 3 is a sectional isometric view of part of another load bearing member;

Figure 4 is a fragmentary cross-section of a modified member similar to that of Figure 3;

Figure 5 is a sectional isometric view of part of a strip of plastics material for use in a load bearing member;

Figure 6 is a sectional isometric view of part of a modified strip of plastics material similar to that in Fig. 5;

Figure 7 is a fragmentary sectional isometric view of a member similar to that of Figure 1 but with the side edges of a sheet of plastics material thereof arranged to seal the sides of the member;

Figure 8 is a view similar to that of Figure 3 but with the member having its side edges sealed off; and

Figure 9 is a transverse section through part of an apparatus for forming a load bearing member.

Referring to the drawings, a load bearing member is used to support a load, and for lowering or raising the load in, for example, a friction winding system such as a lift. The member is passed in contact with a driving means (not illustrated) in the form of, for example, a friction drive roller, and the filaments support a load at each of the free ends of the member. Alternatively a load can be supported at one end and a counter balance weight at the other.

The load bearing member (Fig. 1) comprises a belt comprising a plurality of drawn, high-tensile plain-carbon or alloy steel wire filaments 1 extending longitudinally of the member. The filaments are equi-spaced and are mutually parallel, being arranged so as to lie in a common plane. The cross-sectional geometry of each filament is illustrated as being circular, but it may be any other desired shape.

Above and below the layer of wire filaments 1 is a strip 2 and 3, respectively, of resiliently deformable plastics material, normally a thermoplastic such as natural or synthetic rubber; polyvinyl chloride; polypropylene; nylon; "Terylene" (a Trade Mark for polyethylene terephthalate); or mixtures of these materials, including their co-polymers; the plane of each strip 2, 3 being parallel to the filaments 1. As shown in Figure 1 the strips are of equal thickness.

The application of a tensile load to the composite member along its longitudinal axis A—B (Fig. 1) causes the filaments to be impressed into one or both of the two strips 2, 3 to form temporary individual seatings (Figure 2) for the filaments 1. When the tensile load is reduced or released, the natural resilience of the plastics material returns the strip, for all practical purposes, to its original condition and thickness.

In order to ensure the above mentioned behaviour, the thickness of the strips in the untensioned condition is chosen in accordance with the tensile load to be applied (which should lie within the proportional load/elongation range of the steel wires or filaments 1), the wire diameter, and the compressional resistance of the plastics material selected for the strips, so that the thickness is sufficient to prevent permanent deformation of the plastics material.

The breaking strength of the load bearing member can be incrementally increased for a given width of the member by using multiple layers of filaments 1 (Figure 3) all disposed parallel to each other in a number of parallel planes, adjacent layers of filaments being separated by an intermediate strip 3a of resiliently deformable plastics material.

When utilising two or more layers of filaments 1 in the member, a denser packing of the steel filaments 1 under load can be obtained by offsetting equi-spaced filaments 1 of one layer with respect to the or each adjacent layer, as shown in Figure 4, whilst maintaining separation of the layers by the strips 3a.

To maintain the spacing of the filaments 1 between the strips 2, 3, 3a, the already formed load bearing member can be passed through heated rolls the temperature of which is sufficient to allow the filaments to impress themselves permanently into the strips without adhering to the strips. As an alternative, spacer filaments or strips of resilient plastics material can be interposed between adjacent wire filaments 1. Both these alternatives would form part of the manufacturing operation.

The position of each individual filament 1 can be made more stable by providing longitudinally extending corrugations in the plastics material forming the strips 2, 3, 3a (Figs. 5 and 6). For an intermediate strip 3a the corrugations 4, 5 are formed on both faces of the strip in symmetrical relationship (Fig. 5) or offset (Fig. 6). The seatings formed by the corrugations 4, 5 are appropriate to the geometric cross-section of the filaments 1.

To provide further environmental protection for the filaments 1, and to stabilize the member as a whole, one of the external strips 2, 3 of plastics material can be provided with longitudinal edges that are turned down to protect the sides of the member (Fig. 7 and 8). Thus for a single layer of filaments 1 (Fig. 7), one of the strips, the upper strip 2, is formed as a trough, having side walls 6, inside which the filaments 1 are arranged. The filaments 1 are sealed off by the lower strip 3 of plastics material. In the case of multiple layers of filaments, a similar arrangement is adopted (Figure 8), alternate layers of filaments 1 and intermediate plastics strips 3a being built up within a trough-shaped outer strip 2 having deep side walls

6. Again, the filaments 1 can be in line or offset from layer to layer if desired.

The voids between the wires or filaments 1 in any of the embodiments described above can be filled with viscous or gelated, natural and/or synthetic lubricants, including those materials classed as solid lubricants.

When multiple layers of filaments are utilised, the composite member can be built up from sealed laminates each comprising a single layer of high tensile filaments 1 spaced between two strips 12, 13 of resilient plastics material. Each laminate can be formed by feeding the two strips 12, 13 and the interposed filaments 1 through suitably circumferentially grooved hot calendering rollers 7, 8 (Fig. 9), the peaks 9 of the grooves of the rollers 7, 8 coinciding with the midway portions 10 between adjacent filaments 1, sufficient pressure being applied by the rollers 7, 8 to fuse together the plastics strips 12, 13 to seal off the filaments 1.

It will be realised that the load bearing members described can be used in many different haulage systems not necessarily only in lifts and similar applications.

WHAT WE CLAIM IS:—

1. A load bearing member for a haulage system, comprising a layer of spaced parallel load bearing mono-filaments covered at least on its opposed faces by protective resiliently deformable plastics material, the mono-filaments not adhering to the plastics material.

2. A load bearing member as claimed in claim 1, in which each face of the layer is covered by a strip of resiliently deformable plastics material.

3. A load bearing member as claimed in claim 2, in which the side edges of the layer are covered by strips of resiliently deformable plastics material.

4. A load bearing member as claimed in claim 3, in which each side edge strip is integral with at least one of the facing strips.

5. A load bearing member as claimed in any of claims 1 to 4, comprising superimposed layers of mono-filaments, adjacent layers being separated by resiliently deformable plastics material.

6. A load bearing member as claimed in claim 5, in which the mono-filaments of adjacent layers are offset.

7. A load bearing member as claimed in claim 5 or 6, in which adjacent layers are separated by an intermediate strip of resiliently deformable plastics material.

8. A load bearing member as claimed in claim 7, in which the intermediate strip is corrugated to accommodate the mono-filaments.

9. A load bearing member as claimed in any of claims 1 to 8, in which adjacent mono-filaments within the layer are separated by spacers of resiliently deformable plastics material.

10. A load bearing member as claimed in any of claims 1 to 9, including a lubricant in contact with the mono-filaments.

11. A load bearing member as claimed in any of claims 1 to 10, in which the mono-filaments are high-tensile steel wires.

12. A load bearing member substantially as described herein with reference to and as shown in Figures 1 and 2, Figure 3, Figure 4, Figure 7, Figure 8, or Figure 9 of the drawings accompanying the Provisional Specification.

13. A haulage system comprising a load bearing member as claimed in any of the preceding claims.

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1295718 PROVISIONAL SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

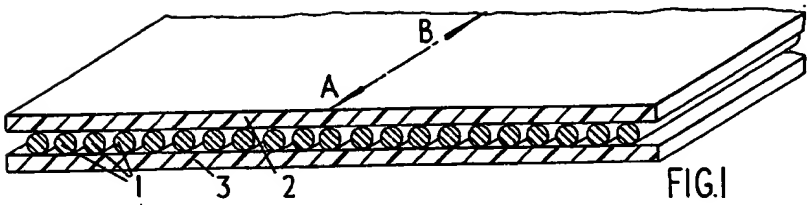

FIG.1

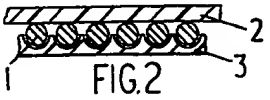

FIG.2

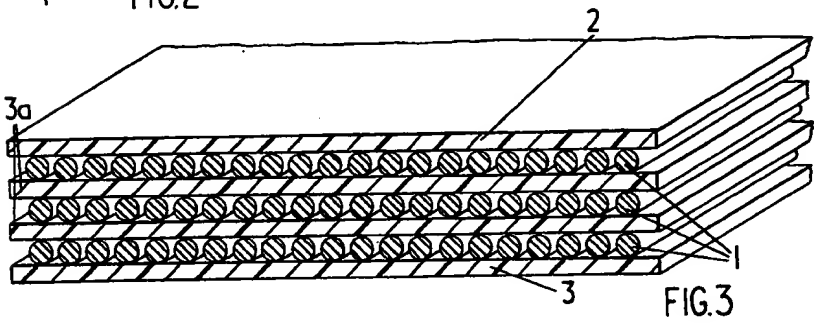

FIG.3

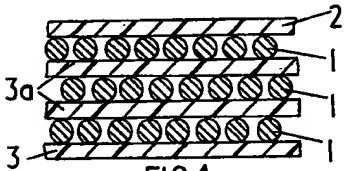

FIG.4

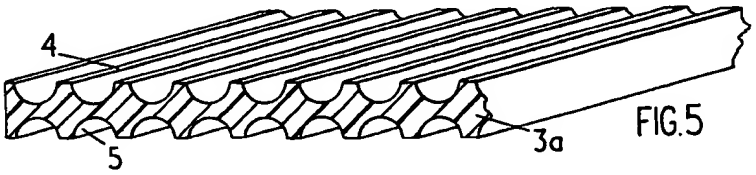

FIG.5

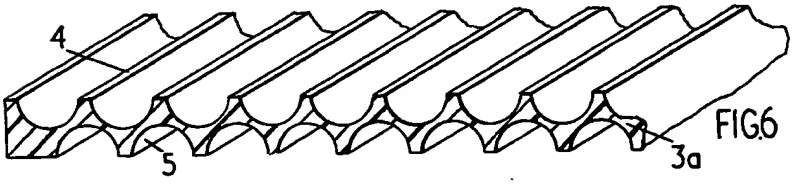

FIG.6

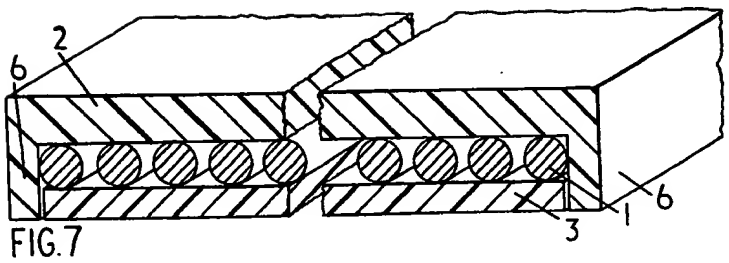

FIG.7

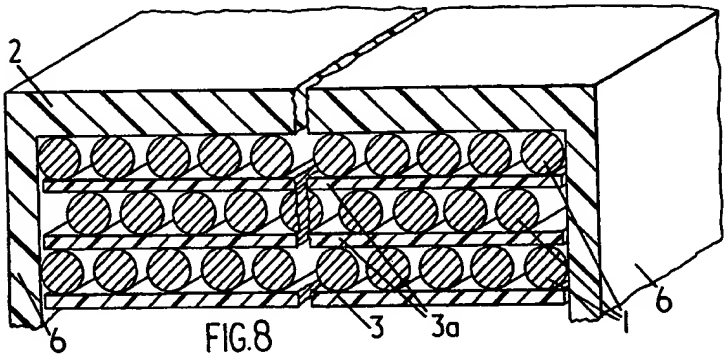

FIG.8

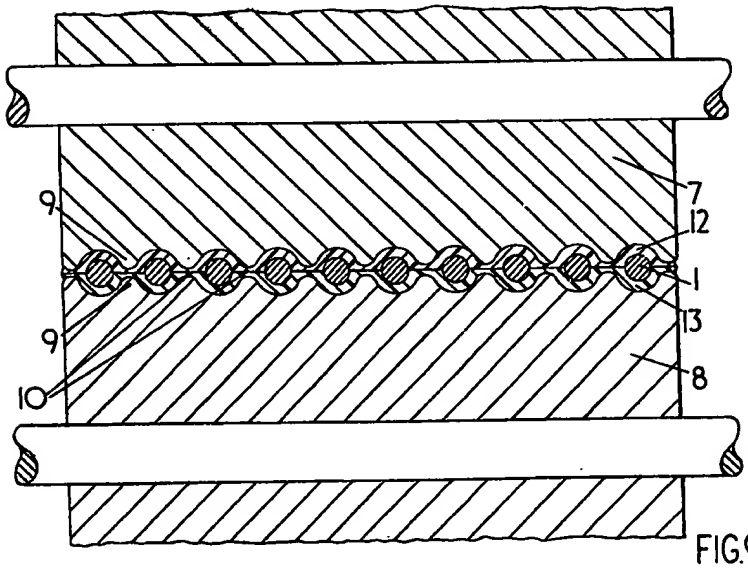

FIG.9